CLAIMS

We claim:

1. A drive mechanism for a flushing apparatus having a flush handle comprising:

a housing;

a flexible drive system in said housing, said flexible drive system operable to move the flush handle between a first non-actuating position and a second full stop actuating position;

said flexible drive system including at least one moveable element, said flexible drive system maintained in substantial continuous contact with said flush handle when said flush handle reaches its full stop position;

said flexible drive system continuing to operate without stalling after said handle reaches its full stop position as said at least one moveable element changes position.

2. The drive mechanism of claim 1 wherein said flexible drive system includes:

a moveable support plate pivotally mounted on said housing;

a motor fixedly mounted on said moveable support plate;

an actuating element moveably mounted on said moveable support plate and operably connected to said motor, said actuating element selectively moved by said motor, said actuating element contacting said handle when said drive system is operable to move the handle to said second full stop position.

3. The drive mechanism of claim 2 wherein the actuating element comprises a cam rotatably mounted on said moveable support plate.

4. The drive mechanism of claim 3 wherein said flexible drive system rotates said cam through substantially 360 degrees for each actuation of said flushing apparatus.

5. The drive mechanism of claim 2 wherein said moveable support plate rotates upon said handle reaching its full stop position to increase the distance between the point where the actuating element is moveably mounted on the moveable support plate and the point where the actuating element contacts the handle, allowing the actuating element to continue its movement without stalling after the handle reaches its full stop position.

6. The drive mechanism of claim 5 wherein the actuating element is a cam rotatably mounted on the moveable support plate, the cam continuing its rotational movement without stalling after the handle reaches its full stop position.

7. The drive mechanism of claim 2 wherein said moveable support plate is pivotally mounted to said housing between a first position and a second position relative to said housing;

a resilient element connected between said housing and said moveable support plate biasing said moveable plate to said first position.

8. The drive mechanism of claim 7 wherein said drive mechanism produces a first torque against said handle when said handle is at its full stop position;

said actuating element and motor produce a second torque when said handle is at its full stop position;

said resilient element produces a third torque applied to said moveable support plate;

said third torque being greater than said first torque and less than said second torque.

9. The drive mechanism of claim 2 wherein said handle moves back to said first non-actuating position as said actuating element continues to rotate beyond the full stop position of the handle.

10. The drive mechanism of claim 1 wherein said flexible drive system includes a motor mounted on said housing;

a flexible cam assembly operably connected to and rotated by said motor;

said cam assembly having a flexible element, said cam assembly in constant contact with said handle as said handle moves from said first non-actuating position to said second full stop actuating position and back to said first non-operating position.

11. The drive mechanism of claim 10 wherein said flexible cam assembly includes a main body portion, a flexible body portion hingedly mounted to said main body portion, and a resilient element operably connected between said main body portion and said flexible body portion biasing said flexible body portion in a substantially radial direction away from said main body portion of said cam assembly.

12. The drive mechanism of claim 11 wherein said flexible body portion of said cam is driven towards said first body portion of said cam as said cam continues to rotate a predetermined distance after said handle has continued to rotate upon said handle reaching its full stop position.

13. The drive mechanism of claim 12 wherein said flexible body portion of said cam is driven away from said first body portion of said cam as said cam continues to rotate beyond said predetermined distance.

14. The drive mechanism of claim 1 including:

a mounting assembly mounting said housing to said flushing apparatus and restraining said housing against movement relative to said flushing apparatus when said flush handle actuating element is moved between said first position and said second position.

15. The drive mechanism of claim 1 wherein said housing includes:

a battery support structure adapted to support a power source for the drive mechanism;

an electronic control electrically connected between said battery support structure and

said flexible drive system to control the operation of said flexible drive system.

16. The drive mechanism of claim 15 including a signal generating element electrically connected to said electronic control means, said signal generating element initiating actuation of said flexible drive system upon the occurrence of a predetermined event.

17. The drive mechanism of claim 16 wherein said signal generating element comprises a sensor which senses the presence and subsequent absence of a user of a sanitary device with which said drive mechanism is associated.

18. The drive mechanism of claim 16 wherein said signal generating element is a timing mechanism generating signals at predetermined time intervals.

19. The drive mechanism of claim 16 wherein said signal generating element comprises:

a sensor which senses the presence and subsequent absence of a user of a sanitary device with which said drive mechanism is associated; and

a timing mechanism which generates signals at predetermined time intervals.

20. The drive mechanism of claim 14 wherein said mounting assembly includes a flange surface extending from said housing, said flange surface adapted to contact said flushing apparatus when said housing is mounted to said flushing apparatus.

21. The drive mechanism of claim 1 wherein said flexible drive system includes an actuating element in contact with said flush handle, said actuating element driven by said flexible drive system through 360 degrees.

22. The drive mechanism of claim 21 wherein said actuating element is a cam.

23. The drive mechanism of claim 22 including a switch element to stop rotation of said cam after said cam has rotated 360 degrees.

24. An apparatus for automatically actuating the flush handle of the flushing mechanism of a sanitary device, the flush handle extending outwardly from the flushing mechanism, the flushing mechanism including a flat exterior surface adjacent a connecting element connecting the flush handle to the flushing mechanism, and a tension device disposed between said flush handle and said flushing mechanism to urge said flush handle back to a first non-actuating position when said flush handle is moved to a second full stop position from said first position, said apparatus comprising:

a housing,

a flexible drive system in said housing, said flexible drive system operable to move said flush handle from said first position to said second position;

said flexible drive system including at least one moveable element, said flexible drive system maintained in substantial continuous contact with said flush handle when said flush handle reaches its second full stop position;

said flexible drive system continuing to operate without stalling after said flush handle reaches its second full stop position;

a sensor operably connected to said flexible drive system to detect a signal generated upon use of said sanitary device and actuate said flexible drive system in response to said signal.

25. The apparatus of claim 24 wherein:

said housing is removably mounted to said flushing mechanism, said housing having a flange surface abutting the flat surface of the flushing mechanism preventing said housing from rotating relative to said flushing mechanism.

26. The apparatus of claim 24 wherein said flexible drive system includes:

a motor powered by batteries;

said motor operably connected to the flush handle to move said flush handle from said first position to said second position upon generation of said signal by said sensor;

said tension device returning said flush handle to said first position upon completion of a flushing operation.

27. The apparatus of claim 26 wherein said flexible drive system includes an actuating element operably connecting the motor to the flush handle and adapted to physically contact said flush handle;

said actuating element moved by said motor upon activation of said motor.

28. A drive mechanism for a flush lever of a sanitary fixture comprising: an electromechanical flexible actuator, within an enclosure, operably engaging the flush lever; first and second bracket halves projecting from the electromechanical flexible enclosure, substantially enclosing and rigidly engaging a bushing and nut securing the flush lever to the sanitary fixture.

29. The mechanism as in claim 28 wherein opposing faces of the first and second bracket halves comprise a complementary topography to the bushing and nut.

30. The mechanism as in claim 26 further comprising attachment means for biasing the first and second bracket halves against the bushing and nut between the first and second bracket halves.

31. An apparatus for activating a flush lever of a sanitary fixture comprising: an electromechanical flexible actuator, within an enclosure, operably engaging the flush lever; first and second bracket halves substantially enclosing and rigidly engaging a bushing; a hexagonal nut securing the flush lever to the sanitary fixture; attachment means for securing the first and second bracket halves to the electromechanical flexible actuator enclosure; and a power source for the electromechanical flexible actuator.

32. The mechanism as in claim 31 wherein opposing faces of the first and second bracket halves comprise a complementary topography to the bushing and nut.

33. The mechanism as in claim 31 further comprising means for biasing the first and second bracket halves against the bushing and nut located between the first and second bracket halves.

34. A control apparatus for a flexible drive mechanism of a flushing mechanism of a sanitary facility comprising:

at least one moveable element in said flexible drive mechanism;

said flexible drive mechanism maintained in substantial continuous contact with said flush handle when said flush handle is moved from a first non-actuating position to a second full stop actuating position and back to the first non-actuating position;

said flexible drive mechanism continuing to operate without stalling after said flush handle reaches said second full stop actuating position as said at least one moveable element changes position;

a self-contained power source;

a sensor for detecting use of the sanitary facility;

a mode selector interconnected with the sensor providing an output upon selected events of sensor operation including a first mode where an output occurs both in response to approach of a user and in response to withdrawal of the user, a second mode where an output occurs in response to withdrawal of the user, and a third mode where an output occurs in response to withdrawal of every second user; and

means for interconnecting the self-contained power source and flexible drive mechanism in response to the mode selector output.

35. The apparatus as in claim 34 further comprising timing means for activating the

means for interconnecting the self contained power source and flexible drive mechanism upon expiration of a time interval of non-use of the sanitary facility.

36. The apparatus as in claim 34 further comprising means for outputting sensor status for the time interval first following activation of one of the self-contained power source and the user button.

37. The apparatus as in claim 35 further comprising means for resetting the timing means upon each interconnection of the self-contained power source and flexible drive mechanism.

38. The apparatus as in claim 34 wherein the control apparatus further comprises a first enclosure and the flexible drive mechanism comprises a second enclosure.

39. The apparatus as in claim 34 wherein the control apparatus further comprises a single enclosure also containing the flexible drive mechanism.

40. The apparatus as in claim 34 further comprising means for deactivating the means for interconnecting after a flush interval.